IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Applicant(s):   Kuoksa
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Art Unit: 1754
Examiner: S. Hendrickson
Title: METHOD AND APPARATUS FOR CONTROLLING
                A CAUSTICIZING PROCESS

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APPEAL BRIEF UNDER 37 CFR § 41.37

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent
Appeals and Interferences" filed June 30, 2006.

1.   ***Real Party in Interest.***

       The real party in interest in this appeal is Metso Paper Automation Oy, the assignee of
the above-referenced patent application.

2.   ***Related Appeals and Interferences.***

       There are no related appeals and/or interferences involving this application or its subject
matter.

3.   ***Status of Claims.***

Claims 1-6, 8-12, 14, 15, and 26 are pending and all claims stand rejected as unpatentable over a combination of references as set forth in greater detail below. The prior art rejection of all pending claims is appealed herein.

Claims 7 13, 16 – 25 have been cancelled.

4.   ***Status of Amendments.***

No claims were filed subsequent to the Final Office Action.

5.   ***Summary of Claimed Subject Matter.***

The present invention as embodied in independent Claim 1 is directed to a method of controlling a causticizing process for producing white liquor from green liquor in which the density of the green liquor being fed to the slaker is controlled to a set value that is calculated based on the total titratable alkali (TTA) in the green liquor, the target value for the TTA, and a model that relates green liquor density to the measured TTA in the green liquor. The invention also includes a method for controlling a slaker within a causticizing process in which the density of the green liquor inlet stream is determined using a specific mathematical equation that is set forth in independent Claim 26.

In the production of pulp, the Kraft recovery process is widely used to recover chemicals, such as NaOH, from the black liquor, which is a byproduct of the pulping process. The recovery is a multi-step process in which the black liquor is combusted to produce smelt. The smelt is then dissolved in a dissolving tank to form a green liquor, which is subsequently fed into a slaker where it is reacted with lime in a causticizing reaction to convert Na_2CO_3 into NaOH. The resulting mixture is clarified to remove the liquid phase, also referred to as the white liquor, from the solid phase. The white liquor can then be recycled to use in pulp digestion at the beginning of the process.

The invention defined in independent Claim 1 is directed to a method of controlling the causticization process by feeding a controlled amount of white liquor into the green liquor so that the green liquor being fed into the slaker is at a controlled density. See page 9, lines 1 – 3. To provide enhanced control over the process, and hence recover a greater amount of NaOH from

the green liquor, Applicants have discovered that the amount of white liquor added to the green liquor can be more accurately determined by applying a model that correlates density of the green liquor to the total tritable alkali (TTA) in the green liquor. In the claimed process, the density of the green liquor entering the slaker is controlled by adding a controlled amount of white liquor so that the density of the green liquor is adjusted towards a set value. On page 8, lines 33 through page 9, line 12, and in Figure 1, the specification describes that the set value for the green liquor is determined in a multi-step process in which a target value for the total titratable alkali (TTA) in the green liquor is determined, the TTA of the green liquor is measured, and a model is provided that relates green liquor density to TTA. The model is then used to calculate the set value for the green liquor density based on the measured TTA and the target value for the TTA. The density of the green liquor is measured before it is fed into the slaker. The set value for the green liquor density and the measured density of the green liquor are then used to determine and control the amount of white liquor that needs to be added to the green liquor. Applicants have discovered that the process steps recited in Claim 1 provide greater control over the causticizing process, which in turn results in greater amounts of NaOH being recovered.

Independent Claim 26 is directed to a method of controlling a slaker within a causticizing process in which the density of the green liquor is adjusted by adding an effective amount of white liquor into a green liquor inlet stream in which the density is of the green liquor stream is determined using the following equation, which can be found in the specification on page 10, lines 1 – 14:

$$D = (TTA+os)/kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset, which is determined using a model having as parameters the green liquor TTA and momentary density of green liquor; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same.

Similarly, dependent Claim 11, which is dependent on independent Claim 1, recites that the green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$$D = (TTA + os)/kk,$$

wherein: D is the green liquor density;

           TTA is the total titratable alkali of the green liquor;

           os is an offset; and

           kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

           the offset being determined on the basis of the model.

As shown in Figure 2 and discussed on page 9, lines 18 – 20, the measured TTA and measured density of the green liquor are used to calculate an offset using the model. The offset can then be used with the target TTA and the angular coefficient to calculate the density of the green liquor. See e.g., page 10, lines 15 – 21.

6.   ***Grounds of Rejection to be Reviewed on Appeal.***

Claims 1-6, 8-12, 14, 15, and 26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Baines, Musow, and Applicants' alleged admissions on page 5 of the specification. The Office Action relies on Baines for the teaching of using a computer to control a causticization and that the computer can monitor any parameter characteristic of the system. The Office Action relies on Musow for teaching that variables can be measured in the causticizing system. The Office Action relies on Applicants' alleged admissions for the teaching of measuring green liquor density and control of white liquor infeed. The Examiner has taken the position that the workings of how a computer system works and makes calculations is conventional and it would therefore be obvious to use a computer to monitor the density or alkali in the process of Baines because doing so asserts control over the process for monitoring for optimum results.

7.   *Argument.*

The Examiner has failed to make a prima facie case of obviousness because 1) the combination of references fail to teach each and every claim element and 2) because there is no motivation to combine the references. Specifically, the combination of references fails to teach at least any one of the following:

    a.   adding white liquor to the green liquor stream being fed into the slaker;

    b.   calculating a set value for the density of the green liquor based on a model that relates total tritatable alkali (TTA) to green liquor density; or

    c.   controlling the density of the green liquor using measurements for the green liquor density and measurements for TTA of the green liquor.

1.   **The Combination of Baines, Musow, and Applicants' Alleged Admissions Do Not Disclose or Suggest Each and Every Element of Claim 1.**

Applicants respectfully submit that the combination of Baines, Musow and Applicants' alleged admissions fail to disclose or suggest the claimed invention. Specifically, the combination of the cited references fails to disclose or suggest any of the following steps that are recited in Claim 1:

    a.   controlling the amount of white liquor added to green liquor to thereby control the density of the green liquor being fed to the slaker towards a set value;

    b.   calculating the set value for the density of the green liquor based on the measured total titratable alkali in the green liquor, a target value for the total titratable alkali, and a model that relates green liquor density to the measured total titratable alkali in the green liquor; or

    c.   controlling the density of the green liquor using both a measured density of the green liquor and the measured titratable alkali in the green liquor.

As discussed in greater below, the Examiner has failed to establish how the combination of references teach any of the above elements. Accordingly, it is respectfully requested that the Board overturn the rejection based on the combination of record.

a.   *The combination of references do not teach controlling the amount of white liquor added to green liquor to thereby control the density of the green liquor being fed to the slaker towards a set value.*

The cited references do not disclose or suggest controlling the amount of white liquor added to green liquor to thereby control the density of the green liquor being fed to the slaker towards a set value. Musow describes a process wherein the causticization process is controlled by adjusting the amount of weak wash solution that is added to the dissolving tank so that the concentration of sodium carbonate in the green liquor is maintained at a pre-determined level. See column 2, lines 27 – 33. For example, FIG. 1, specifically illustrates a schematic of the system wherein the weak wash 16 is added to the dissolving tank 14. There is no disclosure or suggestion in Musow of adding the weak wash to the green liquor after it has exited the dissolving tank. This process is significantly different than the process recited in Claim 1 because the weak wash in Musow is being added to the dissolving tank in which the smelt is being dissolved. In contrast, the claimed invention recites that the white liquor is added to the green liquor after the dissolving process is complete and the green liquor has already been produced.

Baines is directed to a method of controlling the causticizing process by controlling the amount of lime that is introduced into the slaker. See column 5, lines 50-51. For example, Baines states that the "introduction of lime, CaO, to the slaker is the critical point of control." See column 5, lines 48-49. Thus, Baines also does not disclose or suggest the step of controlling the density of the green liquor by controlling the amount of white liquor added to the green liquor.

The Examiner alleges that the Applicant admits that FI Patent No. 66,662 teaches the measurement of green density and control of white liquor infeed. The Examiner's characterization is incorrect. U.S. Patent No. 4,236,960, which is the equivalent of FI Patent No. 66,662, teaches controlling the causticization reaction by the adjusting the amount of lime added to the slaker. For example, the '960 patent states '[o]ne then seeks to adjust the amount of lime (CaO) added to the slaker 19 in such a way to keep K_1, the degree of causticization, constant and as high as possible...." See column 3, lines 7 – 10. Further, Applicants alleged admissions' on

page 5, lines 7 – 21 state that the FI '662 patent describes a process for controlling the causticizing degree by controlling "the amount of calcium oxide added to the causticizing process...." In other words, Applicants' statement on page 5 of the specification describe a process in which the process is controlled by controlling the amount of lime added to the slaker. Thus, Applicants' alleged admissions do not describe adding white liquor to the green liquor.

The processes described in the cited references are completely different than the claimed process in which density of the green liquor is controlled to a set value by controlling the amount of white liquor is added to the green liquor. None of the cited references disclose or suggest adding white liquor to the green liquor, and therefore do not disclose or suggest the step of controlling the amount of white liquor added to the green liquor to thereby control the density of the green liquor being fed to the slaker towards a set value.

The Examiner has asserted that Claim 1 does not recite the feature of adding white liquor to the green liquor. However, it is clear from the language in Claim 1 and in the specification that the Examiner's position is not sustainable. Claim 1 specifically recites the step of "controlling the density of the green liquor being fed to the slaker towards a set value with a density controller controlling an amount of weak white liquor added to the green liquor..." It is clear from the above excerpt of Claim 1 that the step of controlling the density of the green liquor includes adding white liquor to the green liquor before the green liquor is fed into the slaker. This is particularly true because once the green liquor is introduced into the slaker it is reacted with lime and is no longer considered green liquor.

b. *The combination of references do not teach the step of calculating a set value for the density of the green liquor based on a model that relates total tritatable alkali (TTA) to green liquor density.*

The combination of the cited references also do not disclose or suggest the step of calculating a set-value for the green liquor density to be introduced into the slaker based on the measured TTA of the green liquor, a target value for the TTA, and a model that relates the measured TTA in the green liquor to the green liquor density. As discussed above, Claim 1 recites that the step of specifying the set value for the green liquor includes the step of

determining a target value for the TTA, measuring the TTA in the green liquor, providing a model that relates green liquor density to the measured TTA, and calculating the set value based on the measured TTA, target value for the TTA, and the model. In contrast, Musow teaches controlling the causticization reaction by maintaining the concentration of the sodium carbonate at a desired level. Musow <u>does not</u> teach the step of determining a set value for the density, let-alone the step of calculating the set-value using a target TTA, the measured TTA, and a model that relates the measured TTA to density of the green liquor. Baines also fails to teach these steps. In contrast, Baines teaches that the amount of lime that is to be added to the slaker may be determined by measuring concentrations of the primary constituents of the green liquor and the white liquor: carbonate, hydroxide, and sulfide. These components are individually measured to provide the control system with a complete characterization of the reagents participating in the causticizing reaction so that each <u>individual</u> component may be accounted for by the control system. See column 3, lines 9-15. Thus, Baines also fails to disclose or suggest the step of determining a set value for the density, let-alone the step of calculating the set-value using a target TTA, the measured TTA, and a model that relates the measured TTA to density of the green liquor.

In maintaining the rejection, the Examiner relies on Baines for the use of a computer system for controlling the causticizing process, and that it would therefore be obvious to use the computerized process described in Baines in combination with the claimed variables because Musow teaches that different variables can be monitored. For example, the Examiner in the Final Office Action states that "the claims are an indirect way of performing the control exerted more directly by the references [and that] this is an obvious expedient, given a known and well characterized reaction system and relationships between the species...." In essence the Examiner is asserting the invention is obvious because computer systems are known, measuring density is known, and measuring TTA is known. Further, the Examiner's arguments show that he has narrowed the claimed invention down to what he perceives as the "gist" of the invention, i.e., measuring TTA and density of the green liquor. This can surely not be the standard by which proper rejections are made.

In addition, the Examiner's reasoning completely ignores or conveniently overlooks how the TTA and the density of the green liquor are used in the method steps recited in Claim 1. For example, the Examiner has not addressed where the references disclose or suggest the steps of 1) specifying a set-value for the green liquor by: 2) determining a target value for the TTA; 3) providing a model that relates green liquor density to the measured TTA; and 4) calculating the set value for the green liquor density based on the measured TTA of the green liquor, the target value for the TTA, and the model. The Examiner has not provided a reasonable basis for where these method steps can be found in the combination of the cited references. Rather, the Examiner attempts to compensate for these deficiencies by making broad statements that the workings of how the computer makes calculations are deemed conventional and that the differences between the references and claims is which variables are monitored without every providing analysis of how the cited references disclose or suggest the recited method steps. In other words, the Examiner has failed to ascertain the differences between the prior art and the claimed invention because the Examiner has narrowly focused on the parameters of measuring TTA and density while completely ignoring the actual method steps recited in the claims. Thus, the Examiner has failed to compare the actual teachings of the references to the claims and has therefore failed to follow the standard for making an obviousness rejection as articulated by the *Supreme Court in Graham v. John Deere*, 383 U.S. 1 (1966): i.e., ascertaining the differences between the prior art and the claims in issue. This is not the proper inquiry in making an obvious rejection.

c.   *The combination of references do not teach the step of controlling the density of the green liquor using both a measured density of the green liquor and the measured titratable alkali in the green liquor.*

Further, the combination of the references fails to disclose or suggest the step of controlling the density of the green liquor using both a measured density of the green liquor and the measured titratable alkali in the green liquor. As discussed above, Musow teaches measuring the concentration of sodium carbonate of a green liquor in the dissolving tank. See column 2, lines 44 – 48. Baines on the other hand, teaches that the amount of lime that is to be added to the

slaker may be determined by measuring concentrations of the primary constituents of the green liquor and the white liquor: carbonate, hydroxide, and sulfide. These components are individually measured to provide the control system with a complete characterization of the reagents participating in the causticizing reaction so that each underlined individual component may be accounted for by the control system. See column 3, lines 9-15. Thus, neither Musow nor Baines disclose the step of controlling the density of the green liquor using both a measured density of the green liquor and the measured titratable alkali in the green liquor. As noted above, the '960 patent also fails to disclose this step. Thus, the combination of Musow and Baines, with or without the teachings of the '960 patent, fails to disclose or suggest the step of controlling the density of the green liquor using both a measured density of the green liquor and the measured titratable alkali in the green liquor.

For the reasons set forth above, Applicants respectfully submit that the combination of Baines, Musow, and Applicants' alleged admissions fails to disclose or suggest each and every element recited in Claim 1. Applicants respectfully request that the Board overturn this rejection.

2.   **The Combination of Baines, Musow, and Applicants' Alleged Admissions Do Not Disclose or Suggest Each and Every Element of Dependent Claim 11.**

Claim 11, which is dependent on Claim 1, recites that the density of the green liquor is calculated according to the following equation:

recites that the green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$$D = (TTA + os)/kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular

coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

the offset being determined on the basis of the model.

None of the cited references disclose or suggest the above recited equation. The Examiner has failed to show where the equation and its various variables can be found in the references. In maintaining the rejection, the Examiner relies on vague statements that the workings of how the computer makes calculations are known and therefore it would be obvious to use the equation recited in Claim 11. However, such statements cannot support an obviousness rejection. If the Examiner's assertion was true, it is a wonder that any additional patents utilizing mathematical equations and computers could ever be obtained. The Examiner has the burden of showing where the equation recited in Claim 11 is disclosed or suggested in the cited references; he has not met this burden. Thus, Applicants respectfully submit that Claim 11 is patentable over the rejection of record.

3.   **The Combination of Baines, Musow, and Applicants' Alleged Admissions Do Not Disclose or Suggest Each and Every Element of Independent Claim 26.**

Independent Claim 26 recites a process for controlling the causticizing reaction in which the set value for the green liquor density is determined utilizing the following equation:

$$D = (TTA + os)/kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset, which is determined using a model having as parameters the green liquor TTA and momentary density of green liquor; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same.

The process recited in Claim 26 utilizes variables for the TTA of the green liquor, a constant angular coefficient "kk", and an offset "os" that is determined from a model having parameters for the green liquor TTA and the momentary density of the green liquor. For the same reasons discussed above, the cited references also fail to disclose or suggest the above-equation, which is recited in

Claim 26. As discussed above, the Examiner has failed to show where the equation and its various variables can be found in the references.

Additionally, the cited references also fail to disclose or suggest the step of introducing an effective amount of a white liquor stream into the green liquor as recited in Claim 26. For example, the cited references disclose controlling the causticizing process by adding lime to the slaker or weak white liquor to the dissolving tank, which is discussed in greater detail above.

Thus, the combination of the cited references also fail to disclose or suggest each and every element recited in Claim 26. Accordingly, it is respectfully submitted that Claim 26 is patentable over the rejection of record.

4.   **There is no Motivation to Combine the teachings of Baines and Musow**

Applicants respectfully submit that one of ordinary skill in the art would have no motivation to combine Baines and Musow in the manner contemplated by the Examiner. Specifically, neither Baines nor Musow provide the motivation to combine the computer process of Baines with variable measurements described in Musow.

First, the methods described in Musow and Baines are completely different from each other. Baines teaches controlling the amount of lime added to the slaker, whereas Musow teaches maintaining the sodium carbonate concentration at a desired concentration by adjusting the amount of weak wash solution that is added to the dissolving tank. These steps utilize different methods and different chemical reactions for controlling the causticizing reaction, and occur at completely separated points in the Kraft process. As such, one of ordinary skill in the art would not be motivated to select disparate and unrelated elements from Baines to be combined with unconnected elements of Musow.

As noted above, Musow teaches regulating the sodium carbonate concentration of a green liquor in a dissolving tank by measuring conductivity of the green liquor in the dissolving tank. See e.g., column 2, lines 44 – 47. In particular, Musow teaches calculating the concentration of a single component, e.g., utilizing conductivity measurements, to maintain a desired level of sodium carbonate within the green liquor.

In sharp contrast, Baines includes multiple statements that teach away from using measurements, such as conductivity, in controlling the causticizing reaction. First, Baines repeatedly emphasizes that using a single characteristic, such Na$_2$CO$_3$ concentration, conductivity, TTA, or density, in controlling the causticization reaction provides less accuracy and therefore is undesirable. For example, Baines states that "a measurement of a single characteristic of the entire white or green liquor, as taught by Bertelsen, can result in error...." See column 2, lines 27-29. Baines further elaborates that "Bertelsen teaches that the progress of the causticizing reaction can be measured by making a differential conductivity measurement." See column 2, lines 17 – 19. From these excerpts, it can be seen that Baines clearly teaches away from the process described in Musow, and away from using measurements, such as TTA or density, as recited in the claimed process. Baines further states at column 6, lines 10 – 14 that [r]ather it is the determination of the relative concentrations of the liquor components, as opposed to a measurement of a characteristic of the total liquor that is important to the methods of the present invention." Thus, the teachings of Baines include numerous statements that would teach away from the combination of Baines and Musow.

It is clear that Baines goes to great extent to distance the process described therein from the teachings of Musow, which utilizes a single measurement, such as conductivity, to control the causticization process. In light of this clear teaching away from Musow, there would be no motivation to combine the teachings of Baines and Musow in the manner contemplated by the Examiner. For this additional reason, Applicants respectfully request that the Board overturn the rejection of record.

The Examiner attempts to rebut this clear teaching away by stating that relying upon one measurement cautioned against by Baines is an obvious expedient given that one is warned of the risks and given the simplified apparatus requirement of having only one thing to measure. However, this argument ignores and mischaracterizes the teachings of Baines. Baines teaches away from measurements, whether it is single measurement or a combination of measurements, in which the measurement is a single characteristic of the entire white or green liquor, such as density, TTA, or conductivity.

Further, Musow also teaches away from the claimed invention. Specifically, Musow states that conductivity measurements are superior and more accurate than indirect measurements such as TTA measurements of the green liquor. For example, Musow states "[t]he above-described method regulates sodium carbonate concentration based on measurements that are more accurate than such indirect measures as density of the green liquor or total titratable alkali in the green liquor." See e.g., column 2, lines 58 – 63. By teaching that TTA measurements are inferior, Musow teaches away from using TTA measurements of a green liquor for control purposes, and one of ordinary skill in the art would not be motivated to combine the conductivity measurements, or even TTA measurements, of Musow with a control system such as the Baines system. Thus, one of ordinary skill in the art would not be motivated to combine Baines and Musow.

In maintaining the rejections, the Examiner has repeatedly ignored the multiple teachings in both Baines and Musow that teach away from the claimed invention and teach away from the combination of Baines and Musow. Therefore, the rejections of the claims based on the combination of Musow and Baines should be reversed.

8.   *Claims Appendix.*

An appendix containing a copy of the claims involved in the appeal.

9.   *Evidence Appendix.*

No evidence has been submitted to the Examiner or relied upon by the Appellant.

10.   *Related Proceedings Appendix.*

There are not decisions by a court of the Board in related proceedings.

CONCLUSION

In view of the foregoing arguments, Appellant respectfully submits that Claims 1-6, 8-12, 14, 15, and 26 are patentable over the cited references. A decision from the Board of Patent Appeals and Interferences reversing the final rejection of the pending claims is therefore earnestly solicited.

Respectfully submitted,

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CLAIMS APPENDIX

1.   (Previously Presented) A method for controlling a causticizing process for producing white liquor from green liquor by feeding green liquor (H_2O, Na_2CO_3, and Na_2S) and lime (CaO) into a slaker to produce hydrated lime ($Ca(OH)_2$) according to the equation

$$H_2O + CaO \longrightarrow Ca(OH)_2 + heat,$$
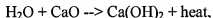
caustizing the green liquor by reacting the hydrated lime and sodium carbonate (Na_2CO_3) within the green liquor to produce sodium hydroxide (NaOH) and calcium carbonate ($CaCO_3$) according to the equation

$$Ca(OH)_2 + Na_2CO_3 \longrightarrow NaOH + CaCO_3, \text{ and}$$
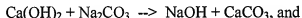
separating the calcium carbonate from the sodium hydroxide, the method comprising controlling the causticizing process by:

measuring the density of the green liquor being fed to the slaker;

controlling the density of the green liquor being fed to the slaker towards a set value with a density controller controlling an amount of weak white liquor added to the green liquor; and,

specifying the set value by:

    determining a target value for the total titratable alkali;

    measuring the total titratable alkali in the green liquor being fed to the slaker;

    providing a model that relates green liquor density to the measured total titratable alkali in the green liquor; and,

    calculating the set value for green liquor density based on the measured total titratable alkali in the green liquor, the target value for the total titratable alkali, and the model; and,

controlling the density of the green liquor using both the measurement result of the density and the measurement result of the total titratable alkali.

2.   (Original) A method according to claim 1, wherein the causticizing process is controlled by applying a model describing the slaker.

3.   (Previously Presented) A method according to claim 2, wherein the slaker is controlled on the basis of the difference between the slaker temperature and the green liquor temperature by adjusting the set value for the temperature difference control on the basis of the difference between the target causticity of lime milk and the causticity titration or titrations, the set value for the causticity being determined on the basis of the model describing the development of the causticity prevailing after the slaker to white liquor causticity.

4.   (Previously Presented) A method according to claim 3, wherein the model in question is a static one and determines a causticity difference.

5.   (Previously Presented) A method according to claim 4, wherein a quotient is calculated by dividing an average of the differences in white liquor and lime milk causticities by a causticity difference provided by the model on the basis of a production average, and the causticity difference produced by the model is multiplied by the quotient.

6.   (Original) A method according to claim 5, wherein the average is calculated for a period of 2 to 40 hours.

7.   (Cancelled)

8.   (Previously Presented) A method according to claim 3, wherein the lime to green liquor ratio is controlled by adjusting the lime to green liquor ratio using the temperature difference control in such a way that when the measured temperature deviates from the temperature target, the lime to green liquor ratio target is changed in the opposite direction.

9.   (Previously Presented) A method according to claim 8, wherein in connection with a production change, the lime to green liquor ratio is changed on the basis of a static model describing the changing of the lime to green liquor ratio during a production change.

10.   (Previously Presented) A method according to claim 9, wherein the static model describing the changing of the lime to green liquor ratio during a production change substantially conforms with a production curve.

11.   (Previously Presented) A method according to claim 1, wherein green liquor density is controlled on the basis of a total titratable alkali by applying the following equation:

$D = (TTA+os)/kk$,

where D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset; and

kk is a coefficient, wherein the coefficient is a constant angular coefficient having a value selected from between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same,

the offset being determined on the basis of the model.

12.   (Previously Presented) A method according to claim 11, wherein the offset is determined on the basis of the green liquor TTA and a momentary density of the green liquor by applying the model including the coefficient.

13.   (Cancelled)

14.   (Original) A method according to claim 11, wherein the model is specified by calculating averages for the variables used in the model.

15.   (Original) A method according to claim 14, wherein after a sufficient green liquor flow and regular titrations for 1 to 40 hours, averages of desired variables calculated over 1 to 40 hours are used in the model.

16 – 25 (Cancelled)

26.   (Previously Amended) A method for controlling a slaker within a causticizing process which comprises

(a)   measuring the total titratable alkali within a green liquor inlet stream;

(b)   determining the density of said green liquor inlet stream based on said total titratable alkali; and

(c)   adjusting the density of said green liquor inlet stream by introducing an effective amount of a white liquor stream into said green liquor inlet stream,

wherein the density of the green liquor inlet stream is determined using the following equation:

$$D = (TTA+os)/kk,$$

wherein: D is the green liquor density;

TTA is the total titratable alkali of the green liquor;

os is an offset, which is determined using a model having as parameters the green liquor TTA and momentary density of green liquor; and

kk is a constant angular coefficient, wherein the coefficient is a constant angular coefficient the value of which is between 0.9 and 1.4 when the unit used for expressing the TTA and the density is the same.